II. SUB-WATERSHEDS

A. Clark Fork River
(tributary to Pend Oreille Lake)

Summary:
The Clark Fork River was added to the 1994 303(d) list, and retained on the 1996 list, as a result of public comment, and listed for metals pollution. The limited data set collected by the USGS at the Whitehorse Rapids monitoring station shows that zinc and cadmium concentrations in the river over the last ten years have declined to a point where water quality standards are not exceeded. Copper was exceeded a total of four times in the last ten years: twice in '92, and once in '93 and '96. An extensive monitoring study done by the State of Montana in 1988 found no metals concentrations exceeded water quality standards at the Cabinet Gorge station. This contradicts USGS data, which used depth integrated bank to bank sampling as opposed to Montana's method of grab samples from the shore. Due to the limited data set, the variability in river flow, the presence of metals contaminated sediments, and other complicating factors the conclusion of this problem assessment is to wait until its scheduled completion date. At that time there may be more information available to base a decision.

1. Physical and Biological Characteristics

The Clark Fork River begins near Butte, Montana and drains approximately 25,000 square miles of western Montana before entering Pend Oreille Lake. It is divided into the upper, middle and lower rivers at the Milltown Reservoir and the Flathead River confluence.

A century of mining and smelting, tailings disposal, and other mine wastes have left the upper Clark Fork and its tributaries severely polluted with toxic metals and other chemicals. Four Superfund sites have been listed in the upper Clark Fork: (1) Silver Bow Creek and the upper Clark Fork from Butte to Milltown (metal residues from mining and smelting); (2) the Montana Pole plant in Butte (creosote and pentachlorophenol from wood treatment); (3) the Anaconda smelter (smelter wastes and widespread deposition of airborne contaminants), and (4) the Milltown Reservoir, which has accumulated toxic metals from upstream sources. Since 1982 EPA, Montana DEQ, industries and other agencies have worked to investigate, prescribe and implement cleanup procedures (EPA 1989).

The middle portion of the Clark Fork is less impacted from metals pollution than the upper portion because metal bearing sediments are trapped behind the Milltown Reservoir (Johns and Moore 1985). The effects of metals is also reduced due to dilution by the Blackfoot River and Rock Creek.

The lower river flows from the Flathead confluence near Dixon, Montana to its confluence with Pend Oreille Lake near Clark Fork, Idaho. This distance also includes the approximately 60 miles (97 km) of Noxon and Cabinet Gorge Reservoirs. The generally westerly flowing lower Clark Fork River is bounded by the Bitterroot Range to the south and the Cabinet Mountains to the north. Much of the drainage is located in the Kootenai, Kaniksu, and Lolo National Forests, encompassing 4,939 square miles (12,800 km^2) with 390 miles (628 km) of streams. Water quality on this part of the river tends to be better because of the volume of water flowing into it, and because the reservoirs may act as sinks for nutrients and sediment (Moore 1997).

The Clark Fork River in Idaho is approximately 11 miles (18 km) long from the Idaho-Montana border to Pend Oreille Lake. It consists of a main channel, a side channel at Foster Rapids, and a large delta at its mouth. The main channel has two riffles (Whitehorse and Foster Rapids) and several large, deep pools with a maximum depth of 76 feet (23 m). River-like conditions persist in the channel downstream to the second vehicle bridge (now closed) at the town of Clark Fork. Beyond this point varying lake levels begin to influence velocity, depth, and general hydraulic conditions in the lower river channel and the delta.

The Cabinet Gorge Dam located at the Montana-Idaho border was constructed in 1951-52 and regulates flows in the Clark Fork River. In 1973 a voluntary agreement between Washington Water Power and the State of Idaho provided for a minimum flow of 3,000 cfs except for periods of mandatory maintenance and safety inspections. This agreement is proposed to be revised in 1998 to 5,000 cfs (Federal Energy Regulatory Commission 1998). River flows are augmented by ground water inflow of at least 800 cfs below the dam (Harenburg *et al.* 1988).

The Clark Fork watershed is 76% forested, 22% grass-shrub vegetation and cropland and 2% wetlands and water (EPA 1990).

2. Pollutant Source Inventory

There are no sources of metals pollution in Idaho's stretch of the Clark Fork River. Upstream metals mining, milling and smelting plus other industrial and municipal discharges are the primary sources of pollution.

2. a. Summary of Past and Present Pollution Control Efforts

No watershed improvement projects in Idaho for reducing metals loading to the river were found in the literature cited.

3. Water Quality Concerns and Status

The Clark Fork River was added to the 1994 303(d) list (and retained on the 1996 list) as a result of public comment, and is listed for metals pollution. Most of the metals pollution in the Clark Fork system resulted from decades of past mining activities within the basin, an issue that is currently being addressed by federal and state agencies in Montana. Metals of concern in the Clark Fork are copper, zinc, arsenic, cadmium, and lead (Ingman and Kerr, 1989).

Bottom sediments have been examined for metals contamination (Moore, 1997) primarily in the Cabinet Gorge and Noxon reservoirs. Copper and zinc are the metals of greatest concern because they are found in elevated concentrations in bottom sediments. No toxicity or bioaccumulation data exist to determine if these elevated levels are affecting aquatic biota. A catastrophic event may remobilize these bottom sediments and affect beneficial uses in downstream waters, however, at this point it is highly speculative without further study.

Very little fish tissue analyses have been conducted in the lower reach of the Clark Fork River. In 1986, Barnard and Vashro determined that bioaccumulation of copper and mercury was comparable to other noncontaminated waters elsewhere in the region. They found elevated levels of zinc (55 to 166 ppm) in the 68 fish sampled. In 1993 a limited study of fish tissue indicated that mercury levels were high in squawfish and that further research was necessary.

3. a. Applicable Water Quality Standards

The Clark Fork River in Idaho is listed for metals pollution. IDAPA 16.01.02.250.07. Numeric Criteria for Toxic Substances, protects cold water biota and human health from certain toxic substances. Metals which have been of historical concern in the river are copper, zinc, arsenic, cadmium, and lead. The maximum allowable concentrations of these metals in Idaho waters are found in Table 1.

Table 1.

Metal	Dissolved Concentration (mg/l)*
copper	0.0085
zinc	0.0791
arsenic	0.0062 (total recoverable concentrations)
cadmium	0.00085
lead	0.00065

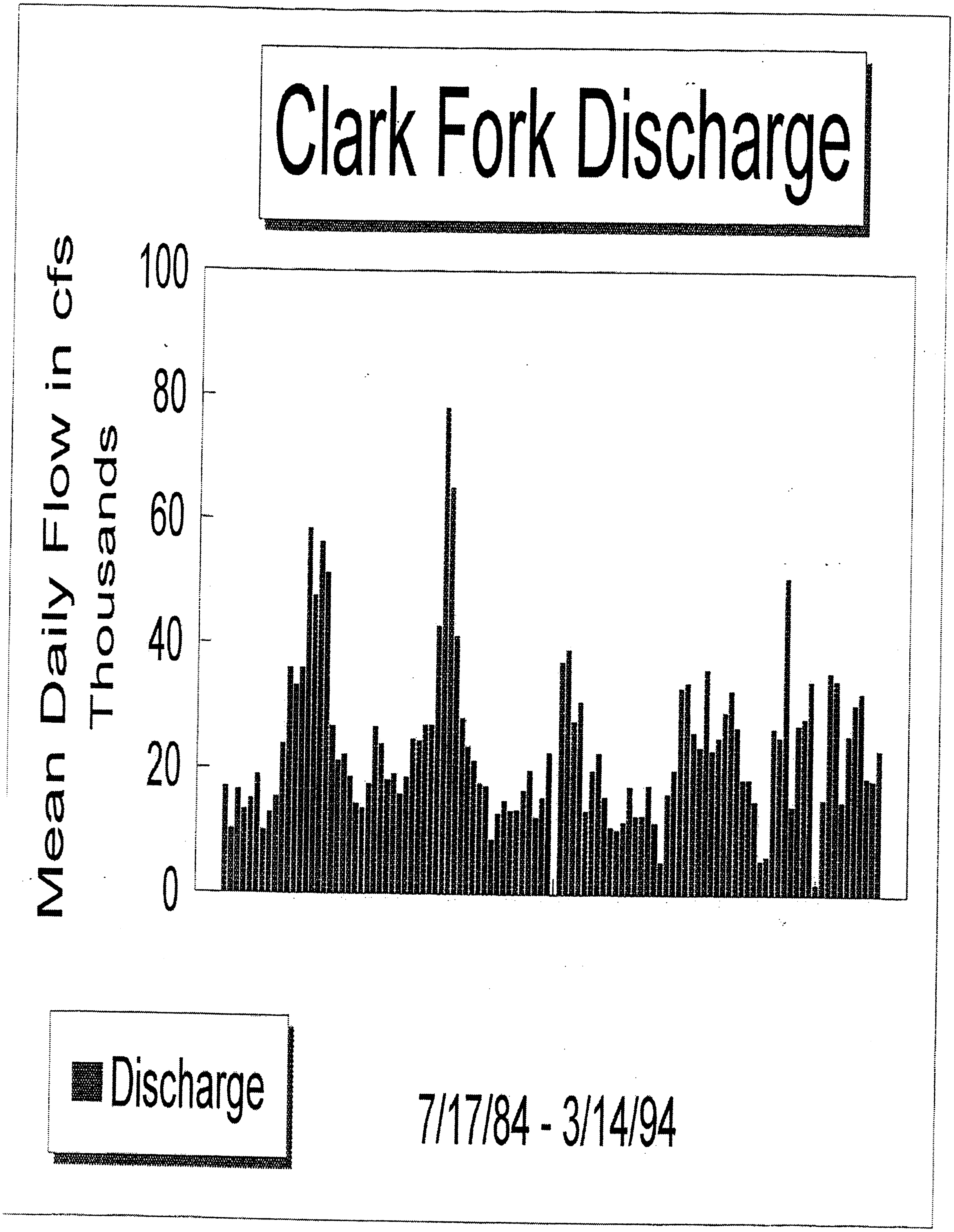
*Using a hardness of 85.7mg/l (ASARCO 1998).

3. b. Summary and Analysis of Existing Water Quality Data

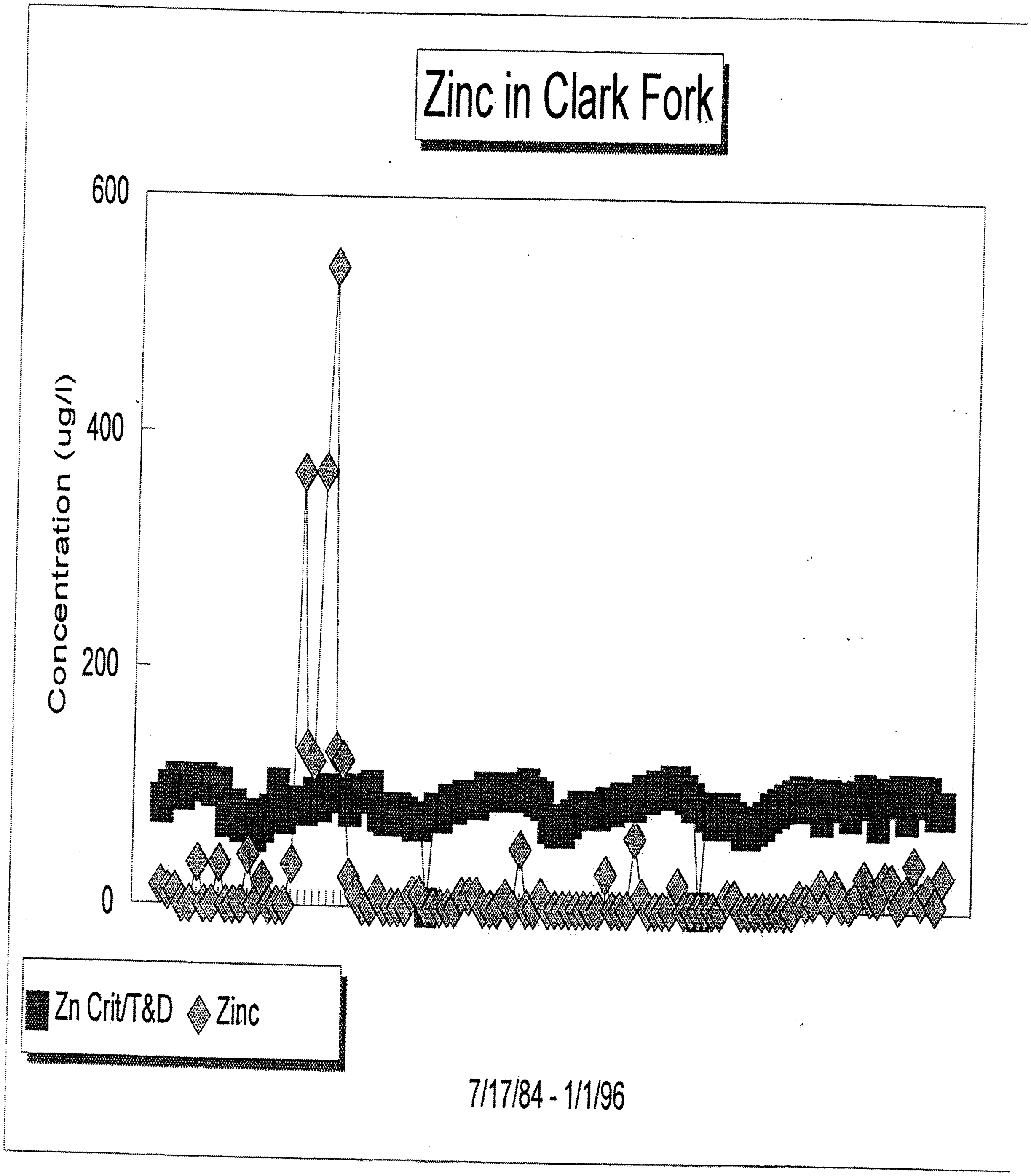
Examination of the USGS monitoring data at the Cabinet Gorge station shows that zinc has not exceeded standards since 1985, cadmium last exceeded standards in 1991, and copper exceeded standards four times in the last ten years (Tables 2, 3 and 4). Sampling frequency ranged from six to twenty times per year from 1984-1988, quarterly from 1990 -1993, and once yearly from 1994-1997. Improving water quality in the Clark Fork may be attributed to cleanup efforts in the headwaters and reductions of pollutants from industrial and municipal facilities in Montana.

Monitoring data presented in Tables 2, 3, and 4 should be examined with the following information in mind. Beginning in 1992, the USGS at the Cabinet Gorge station began using clean sampling techniques to improve data accuracy down to 1ppb. This was necessary due to the discovery of inaccurate sampling results for zinc, copper and lead concentrations, and the increasing scientific interest in more accurate monitoring data. Error in metals concentrations before this date were over-estimated by approximately ≤50% for zinc, ≤10% for copper, ≤4% for lead, and no estimated error for cadmium (M. Hardy personal communication 1998).

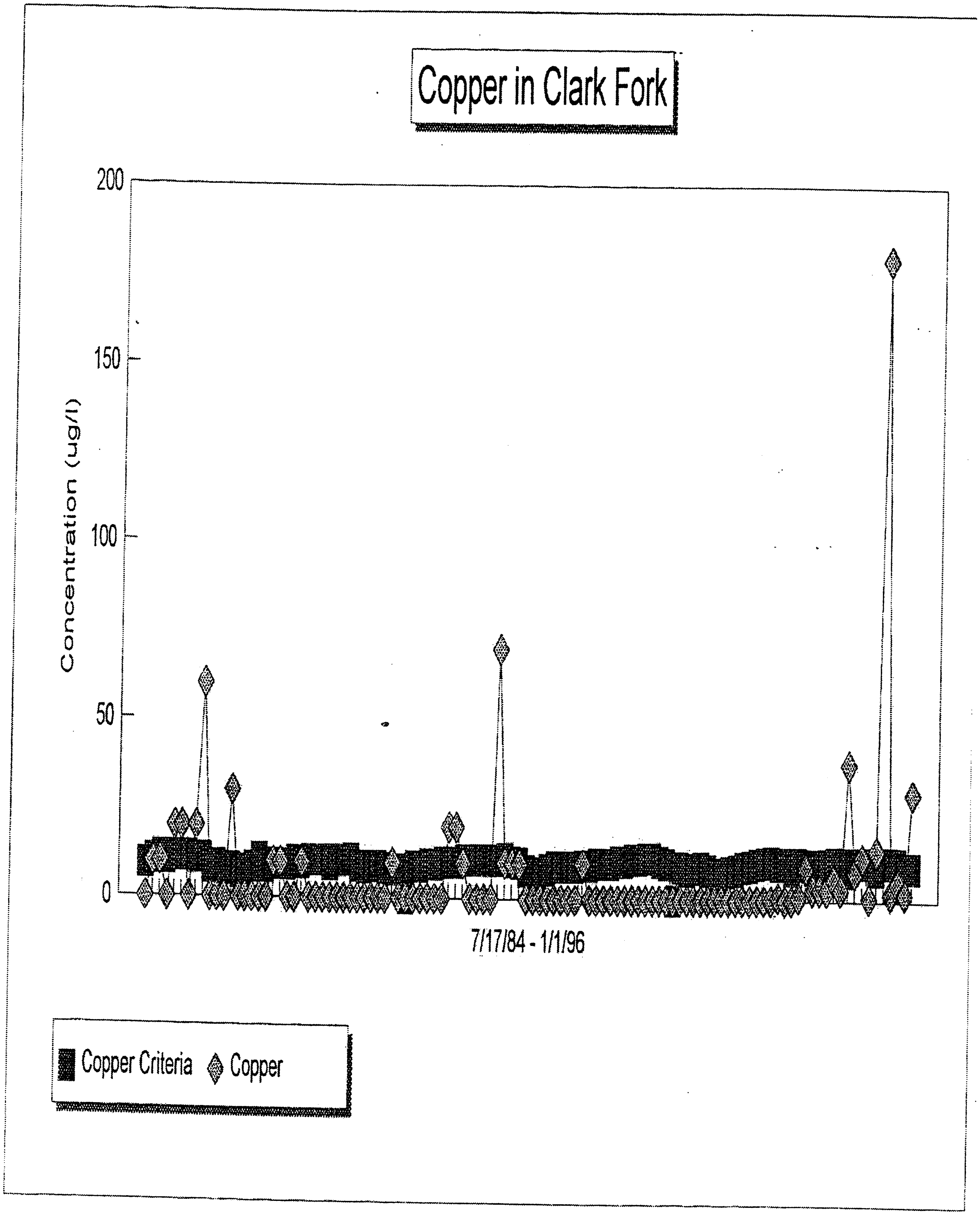
In 1986, Barnard and Vashro determined that bioaccumulation of copper and mercury was comparable to other noncontaminated waters elsewhere in the region. They found elevated levels

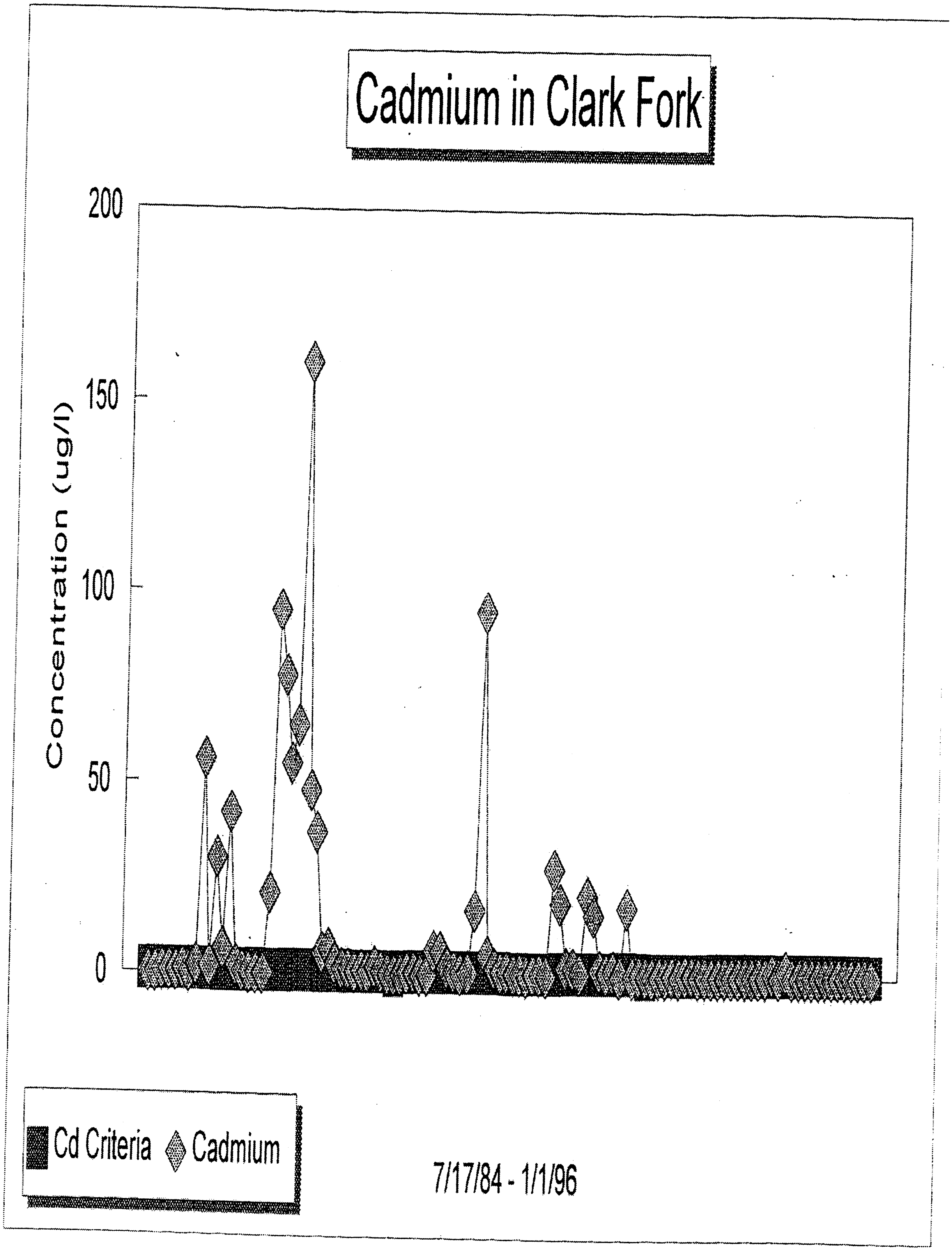


Clark Fork Discharge
Mean Daily Flow in cfs
Thousands
100
80
60
40
20
0
Discharge
7/17/84 - 3/14/94



Zinc in Clark Fork
600
400
200
0
Concentration (ug/l)
Zn Crit/T&D
Zinc
7/17/84 - 1/1/96


Copper in Clark Fork
200
150
100
50
0
Concentration (ug/l)
7/17/84 - 1/1/96
Copper Criteria
Copper



Cadmium in Clark Fork
200
150
100
50
0
Concentration (ug/l)
Cd Criteria
Cadmium
7/17/84 - 1/1/96

of zinc (55 to 166 ppm) in the 68 fish sampled. There is no human health criteria for zinc

concentration in fish tissue in the Idaho standards or EPA's Quality Criteria for Water -1986 (Gold Book).

Another major source of metals monitoring data was a study conducted in 1988 which measured copper, zinc, arsenic, cadmium and lead seventeen times throughout the year at thirty stations along the Clark Fork River. Data shows that standards were not exceeded for these metals at the Cabinet Gorge monitoring location (Ingman and Kerr 1989). This data is included with the USGS data in Tables 2, 3, and 4, however the sampling method used may not have accurately assessed metals concentration.

In 1993, Hoelscher sampled fish for arsenic, cadmium, chromium, copper, lead and mercury. This study was intended to provide a gross indication of potential human health risks. Results indicated that regular consumption of the northern squawfish could pose a risk of mercury intoxication. His conclusion was a recommendation that mercury bioaccumulation requires further study.

In the future, considerably more information will be available on metal bearing sediments and their effect on aquatic life. As part of their relicensing agreement, Washington Water Power will be conducting analyses of sediments in the river and reservoirs to determine if fish tissue sampling is necessary. If indicated, fish tissue analyses will be conducted and the appropriate human health advisories will be determined (Federal Energy Regulatory Commission 1998).

USGS also monitors for barium, a metal used in metallurgy, paint, glass, and electronics industries. It is present in the river, however concentrations are far below the limits for drinking water and cold water biota.

3. c. Data Gaps For Determination of Support Status

A more intensive monitoring of river metals concentrations began in 1998 in conjunction with the Washington Water Power dam relicensing process and the Tri-State Council's Clark Fork - Pend Oreille Watershed Monitoring Program. These efforts, if sampling methodology is equivalent to USGS protocols, should provide more frequent sampling for long term trend monitoring of metals in the river and also serve to establish baseline levels prior to the Rock Creek mine discharge, if the mine is permitted.

Bioaccumulation of metals in the Clark Fork River requires further investigation. The WWP investigation of metals present in bottom sediments and the follow up study on fish tissue analyses should fill this need.

4. Problem Assessment Conclusions

In summary, due to the very small sample size and the limited number of metals examined, it is very difficult to correctly assess if a TMDL is required for metals pollution on the Clark Fork River. The data indicates that prior to the late 1980's the Clark Fork River routinely exceeded standards for certain metals at the Cabinet Gorge station. Data since that time was taken on an infrequent basis and conflicts with other sampling results conducted using a different sampling technique. Due to this conflicting data and an inadequate data base, the conclusion of this problem assessment will be deferred until 2003. At this time, we anticipate more information will be available from several different monitoring efforts currently underway.

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B. JOHNSON CREEK
(tributary to the Clark Fork River)

Summary

The problem assessment for Johnson Creek will be completed in 2003 along with the Clark Fork River.

1. Physical and Biological Characteristics

Johnson Creek flows into the south channel of the Clark Fork River delta. Fish habitat surveys conducted in July, 1992 indicate that Johnson Creek consists of 59% riffles, 17% pools, 14% runs/glides, 6% pocket water, and 4% dry channel based on the total length of the surveyed habitat. Johnson Falls, a migration barrier to adfluvial bull trout and westslope cutthroat trout, is located approximately one mile upstream from the mouth of Johnson Creek. Excess bedload, loss of large woody debris, and altered water delivery and flow patterns have resulted in an unstable channel and are believed to be the major limiting factor to bull trout production in Johnson Creek. The backwater effect of Pend Oreille Lake also contributes to bedload aggradation without development of riparian vegetation on the lowermost reaches. Johnson Creek is considered a condition yellow watershed by the U.S. Forest Service, meaning activities in the watershed must proceed with caution.

2. Pollutant Source Inventory

Point Source Discharges

Nonpoint Source Discharges

Nonpoint sources of pollution contributing to the impairment of beneficial uses in the Johnson Creek watershed include:

Roads - A road parallels Johnson Creek for almost its entire length upstream to the falls. This road limits recruitment of large woody debris to the system. Roads upstream in the watershed have shown evidence of failures, including a stream crossing on private land. Failures are likely contributing to bedload aggradation within the streambed.

Timber Harvests - Several small timber sales have been planned and/or sold in the Johnson Creek drainage on Forest Service lands. Timber harvest has also occurred on private lands, and recruitment of large woody debris to the stream channel appears to be lacking.

Diversions - There are no known diversions at this time, but as recently as 1992 there was a proposal to divert water from Johnson Creek for power generation. Depending on the size and location of the bypass, a power diversion could significantly impact the water quality of Johnson Creek.

2.a. Summary of Past and Present Pollution Control Efforts

3. Water Quality Concerns and Status

The US Environmental Protection Agency determined that sediment, flow, and habitat alterations threaten Johnson Creek's beneficial uses. Based on an evaluation of Beneficial Use Reconnaissance Project data for Johnson Creek using the 1996 Water Body Assessment Guidance, the IDEQ categorized Johnson Creek as not having full support of beneficial uses.

3.a. Applicable Water Quality Standards

3.b. Summary and Analysis of Existing Water Quality Data

3.c. Data Gaps For Determination of Support Status

4. Problem Assessment Conclusions

References